

CHARGE NUMBER: Project 1720
PROJECT TITLE: Physiochemical Morphology
PERIOD COVERED: September 1-30, 1985
PROJECT LEADER: E. Thomas
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I. Objective: 1. To determine the biochemical and biophysical properties of chloroplast submembrane preparations with respect to oxygen evolution and elucidate the degradation pathways of chloroplast proteins as a function of senescence. (V. Baliga and H. Nakatani)

Status: Intact tobacco chloroplasts were isolated from both ripe and senescent leaves that had been grown under normal conditions in the field. It was determined that the rates of electron transport were ten times less in the chloroplasts isolated from the senescent leaves compared to those from ripe leaves. Chlorophyll (chl) levels were also studied on the ripe and senescent tobacco leaves. While the total chl decreased as the plants matured and senesced, the chl a to chl b ratio remained constant. In another study, chloroplasts isolated from su/su plants were found to have both intact reaction centers and all their associated antenna chl proteins.

Plans: Future studies will continue to document the differences in the photosynthetic electron transport between green and senescent tobacco leaves. Currently, it is planned to use material obtained from coker 319 bright tobacco grown in the Research Center greenhouse. In another study, whole PSII particles will be separated from thylakoid membrane extracts. The oxygen evolving activity from purified components of PSII will be compared to the activity of intact photosynthesising particles.

II. Objective: Study the physical and chemical properties of green tobacco and relate them to the mechanical properties of cured leaf. (E. Taylor, E. Thomas, J. Lyle, P. Echlin)

Status: The study of cellulose microfibrils in green tobacco cell walls by pt replica imaging has been completed and is being issued as a special report. The replicas from this research will also be used in a second study on microfibril organization. The energy dispersive x-ray (EDS) study on element distributions of tobacco cells has continued with over 102 tobacco leaves having been analysed. The data is being statistically studied using the RS/1 software on the VAX. In a separate study, a set of plants spiked with high levels of rubidium and strontium have been examined by EDS. There were detectable levels of both elements in the four major cell types. The only visible sign of stress to these plants was a slight curling of the leaves, which indicated a possible calcium deficiency.

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Plans: Four cell types from the leaves from each of the five stages of growth will be analyzed for Na, Mg, P, S, Cl, K, and Ca with the use of the energy dispersive x-ray spectrometer. Further studies on the organization of the cell wall microfibrils will be carried out on frozen hydrated protoplasts using the SEM and Pt replicas using the TEM. The Rb and Sr concentrations in the spiked plants will be compared to the K and Ca levels of normal plants. The distributions of Rb and Sr should respectively mimic the distributions of K and Ca.

SERVICE WORK: The composition of some deposits on a grinder blade was determined at the request of H. Merritt. Assistance was provided to the Entomology Group in a light microscopy study of a nematode. The image analysis system was used to assist process engineering in their studies on shred length as a function rag size. The composition of a unknown slurry from D-Pilot Plant was determined by EDS to be primarily Fe and Cr in dilute sulfuric acid. A section of clutch lining was examined by EDS for the presence of asbestos. No asbestos fibers were present.

Eddie Doran

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